

Module 2: Fire Safety

Lesson 5: Introduction to Fire Safety

Self-Study Guide

Lesson Overview

Lesson Purpose This lesson will help you prepare to take classroom training in fire safety. The lesson explains basic principles of fire chemistry and introduces the firefighting resources that you will be using. It also previews what you will learn in other lessons about fire safety.

Lesson Objectives After completing this lesson, you should be able to:

- Describe the role of CERTs in fire safety.
- Correlate fire classifications with firefighting resources.

Estimated Time 20 minutes

Contents This lesson includes the following sections:

- Lesson Overview
- Fire Chemistry
- Fire Classification
- Firefighting Resources
- Lesson Summary

What does it take for a fire to burn?

Fire requires three elements: Heat, fuel, and oxygen.

- Heat is required to elevate a material's temperature to its ignition point.
- The second required element is fuel—material to be burned. The fuel may be solid, liquid, or gas.
 - The type and quantity of the fuel will dictate which method should be used to extinguish the fire.
- The third required element is oxygen.
 - Most fires will burn vigorously in any atmosphere of at least 20 percent oxygen.
 - Without oxygen, most fuels could be heated until entirely vaporized without burning.

In this lesson, you'll learn about classes of fire and the tools that you can use to suppress each class of fire.

The CERT Fire Safety Role

During a disaster, the first priorities of professional firefighters are life safety and putting out major fires. They may be hampered by impassable roads, inadequate resources, and other factors.

As a CERT member, you can assist in fire safety by:

- Putting out small fires.
- Preventing additional fires.
- Shutting off utilities.
- Helping with evacuations where necessary.

Understanding basic fire chemistry and firefighting resources will help you carry out your fire safety roles.

Fire Chemistry

On the previous page, you learned that for fire to exist, fuel, heat, and oxygen must be present. Put all three together, and a chemical reaction (fire) can occur. Take any element away and permanently interrupt the reaction, and the fire will not ignite or reignite. One element—fuel—is especially important because it determines fire classification and dictates fire suppression methods.

Fire Classification

Fires are classified according to the type of fuel feeding the fire. Four fire classifications are described below. It is extremely important to identify the fuel so that the correct method and agent for extinguishing the fire can be selected.

Class A Fires

Class A fires are those in which the fuel consists of **ordinary combustibles**, such as:

- Paper.
- Cloth.
- Wood.
- Rubber.
- Most plastics.

Class B Fires

Class B fires are fed by:

- **Flammable liquids**, such as oil and gasoline.
- **Combustible liquids**, such as charcoal lighter fluid and kerosene.

These fuels burn only at the surface because oxygen cannot penetrate the depth of the fluid. Only the vapor burns when ignited.

Class C Fires

Class C fires are energized by **electrical equipment** such as wiring and motors.

When the electricity is turned off and is no longer feeding the fire, the fire becomes a Class A or B fire depending on the source of the fuel.

Class D Fires

Although not normally found in residential areas, Class D fires are fueled by **combustible metals** such as:

- Aluminum.
- Magnesium.
- Titanium.
- Potassium.
- Zirconium.

Knowledge Review

Instructions: Review the fire descriptions. Identify the fire class by inserting A, B, C, or D in the boxes on the left. When you are finished, turn to the next page to check your answers.

- ☐ Electrical power lines felled by a tree are lying across a roof, which catches fire.
- ☐ Temperatures in a work shed rise, and gasoline-soaked rags spontaneously combust.
- ☐ A candle on a table ignites nearby draperies.
- ☐ Magnesium supplies in a factory ignite when fire spreads from a waste paper fire.
- ☐ Oil spilled in a highway accident catches fire.
- ☐ A wildfire spreads through acres of forest.

Knowledge Review: Answer Key



Instructions: Compare your answers to the correct ones shown below.

- C** Electrical power lines felled by a tree are lying across a roof, which catches fire.
 - B** Temperatures in a work shed rise, and gasoline-soaked rags spontaneously combust.
 - A** A candle on a table ignites nearby draperies.
waste paper fire.
 - D** Magnesium supplies in a factory ignite when fire spreads from a
 - B** Oil spilled in a highway accident catches fire.
 - A** A wildfire spreads through acres of forest.
- Electrical power lines lying across a roof: **Class C** because the fire is energized by the electrical power lines. If the power source were cut off, the fire would become a Class A fire.
 - Temperatures in a work shed rise, and gasoline-soaked rags spontaneously combust: **Class B** because the fire is fueled by flammable and combustible liquids.
 - Draperies ignited by a candle: **Class A** because the fire is fueled by ordinary combustibles.
 - Magnesium supplies ignited by a waste paper fire: **Class D** because the fire is fueled by combustible metals.
 - Burning oil from a highway accident: **Class B** because the fire is fueled by flammable liquids.
 - Wildfire spreading through a forest: **Class A** because trees and other vegetation are ordinary combustibles.

Firefighting Resources

One important reason for identifying the fire classification is to select the most appropriate means of suppressing the fire.

Four types of firefighting resources are available:

- Portable fire extinguishers
- Interior wet standpipes
- Confinement
- Creative resources

Portable Fire Extinguishers

Portable fire extinguishers are the most common device for suppressing small fires. A well-prepared home or workplace will have at least two portable fire extinguishers. There are four main types of portable fire extinguishers, which will be presented in more detail in the next few pages.

Interior Wet Standpipes

Interior wet standpipes are usually found in commercial and apartment buildings. These devices:

- Usually consist of 100 feet of 1½-inch jacketed hose with a ¾-inch nozzle tip.
- Deliver up to 125 gallons of water per minute.
- Should be used by three-person teams (one person to handle the hose, one to bleed air from the line, and one to control water pressure).

Confinement

Confining an interior fire by closing doors to rooms and hallways may help to restrict the spread of smoke and heat and limit the amount of oxygen available to the fire.

Creative Resources

Available materials can be used to fight fires. Examples include:

- Swimming pool or spa water and buckets.
- Sand or dirt and shovels.
- A garden hose.

Types of Portable Fire Extinguishers	
Water extinguisher	<p>Water extinguishers are used on Class A fires. Use caution to avoid scattering lightweight materials with the pressurized water and spreading the fire.</p> <p>Standard characteristics:</p> <p>Capacity: 2½ gallons Range: 30-40 feet Pressure: 110 pounds per square inch (psi) Appearance: Usually silver</p>
Dry chemical extinguisher	<p>Dry chemical extinguishers rated for Class B and C fires have a sodium bicarbonate base.</p> <p>Multipurpose dry chemical extinguishers have a monoammonium phosphate base. They are effective for Class A, B, and C fires.</p> <p>Standard characteristics:</p> <p>Capacity: Approximately 10-20 seconds discharge time Range: 8-12 feet Pressure: 175-250 psi Appearance: Usually red</p>
Carbon dioxide extinguisher	<p>Carbon dioxide extinguishers, while still in use, are becoming less common. CO₂ extinguishers are used on Class B and C fires.</p> <p>Standard characteristics:</p> <p>Capacity: 8-30 seconds Range: 3-8 feet</p>
Specialized extinguisher	<p>Specialized extinguishers are also less common. An example of a specialized extinguisher is the Class D dry powder extinguisher, which uses special agents to remove oxygen from a Class D fire.</p>

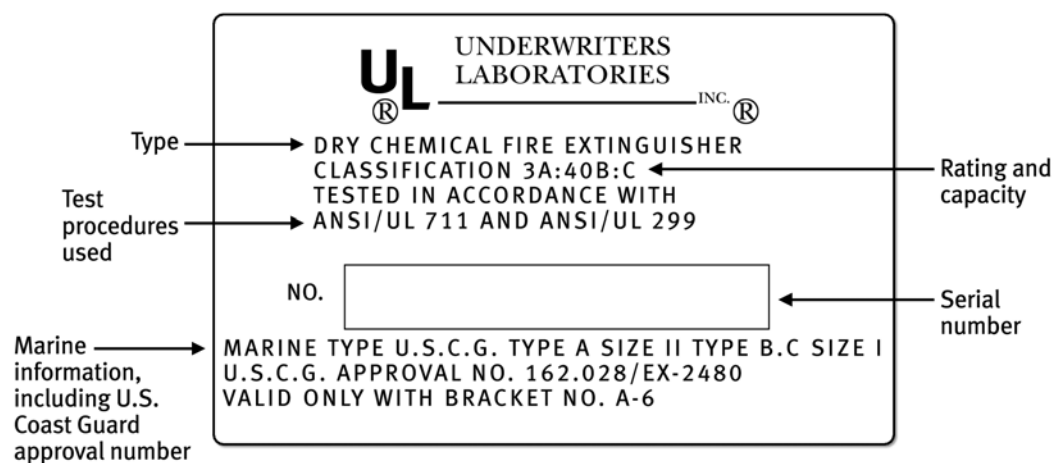
Portable Fire Extinguisher Ratings

Portable fire extinguishers must be rated and approved by the State Fire Marshal and by Underwriters Laboratories.

The manufacturer's label displays the extinguisher's rating and properties, including:

- Type of extinguisher.
- Classification rating.
- Strength and capacity.

Sample Manufacturer's Label



Graphic of a Sample Manufacturer's Label with arrows pointing to the following parts of the label:

- Type
- Test procedures used
- Marine information including U.S. Coast Guard approval number
- Rating and capacity
- Serial number

Rating and capacity: Fire extinguishers are rated both for fire classification and for capacity. For Type A fires, the capacity is in gallons (1 = 1¼ gallons, 2 = 2½ gallons, 3 = 3¾ gallons, etc.). For Type B fires, the number represents square feet of coverage (e.g., 2 means 2 square feet).

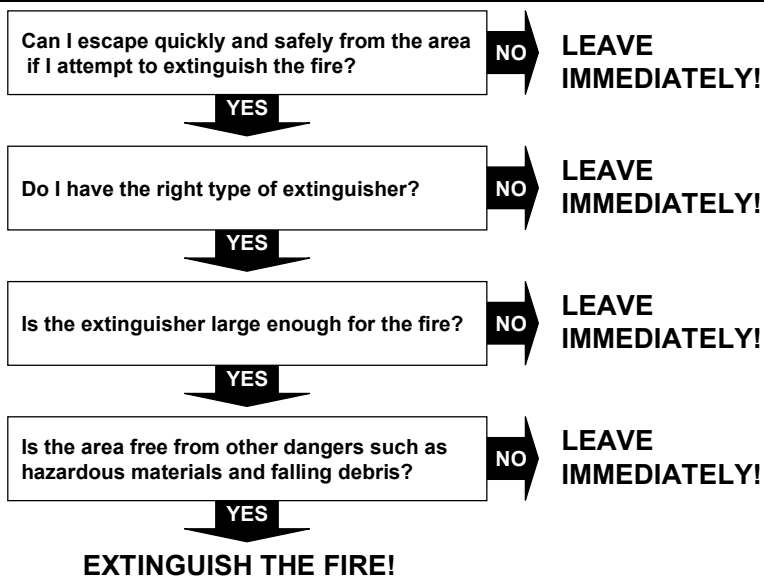
Choosing the Right Extinguisher for the Type of Fire

In suppressing fires, it is absolutely essential that you use the right tool for the job. The chart below summarizes the types of extinguishers that can be used for each class of fire and the methods used by each device.

Fire Types, Extinguishing Agents, and Methods		
Fire Type	Extinguishing	
	Agent	Method
Ordinary Solid Materials	Water	Removes heat
	Foam	Removes air and heat
	Dry chemical	Breaks chain reaction
Flammable Liquids	Foam CO ₂	Removes air
	Dry chemical	Breaks chain reaction
Electrical Equipment	CO ₂	Removes air
	Dry chemical	Breaks chain reaction
Combustible Metals	Special agents	Usually remove air

Deciding To Use a Fire Extinguisher

Before attempting to fight any fire with an extinguisher, ask yourself the following questions.



Remember . . .

- If you answer "No" to any question on the flowchart, do not try to put out the fire. Instead, leave the building immediately. Shut all doors as you leave to slow the spread of the fire.
- If you answer "Yes" to all questions, you should attempt to extinguish the fire.
- You'll have an opportunity to learn and practice fire suppression techniques in the CERT classroom training.

Knowledge Review

Instructions: Select the correct answer. When you are finished, turn to the next page to check your answers.

1. A _____ may be rated for A, B, and C fires.
 - ☐ Water extinguisher
 - ☐ Dry chemical extinguisher
 - ☐ CO₂ extinguisher
 - ☐ Specialty extinguisher
2. Water can be used to extinguish:
 - ☐ Only Class A fires.
 - ☐ Class B and C fires.
 - ☐ Only Class B fires.
 - ☐ Class A, B, and C fires.
3. If you discovered a small fire and a fire extinguisher was available, how would you decide whether to extinguish the fire?

Knowledge Review: Answer Key

Instructions: Compare your answers to those shown below.

1. A _____ may be rated for A, B, and C fires.

- ☐ Water extinguisher
- ☒ **Dry chemical extinguisher**
- ☐ CO₂ extinguisher
- ☐ Specialty extinguisher

A multipurpose **dry chemical extinguisher** may be rated for A, B, and C fires. Some dry chemical extinguishers are rated only for B and C fires.

2. Water can be used to extinguish:

- ☒ **Only Class A fires.**
- ☐ Class B and C fires.
- ☐ Only Class B fires.
- ☐ Class A, B, and C fires.

Water can be used to extinguish **only Class A fires**, which are fueled by ordinary combustibles.

3. If you discovered a small fire and a fire extinguisher was available, how would you decide whether to extinguish the fire?

When deciding whether to extinguish a fire:

- Consider safety: Can you escape quickly and safely from the area?
- Determine if the extinguisher has adequate capacity (also printed on the UL label).
- Make sure the area is free from other hazards, such as hazardous materials and falling debris.
- If all of these criteria are met, you can attempt to extinguish the fire.

Module Overview: Lesson 6: Reducing Fire Hazards

Fire safety is more than putting out fires when they occur. Fire safety also depends on prevention.

As a CERT member, part of your fire safety role is to identify fire hazards in the home and workplace and to use fire prevention strategies to mitigate those hazards.

In Lesson 6, you'll learn how to identify and mitigate fire hazards in the home and workplace.

Module Overview: Lesson 7: Safe Fire Suppression

As a CERT member, one of your roles will be to suppress small fires. During fire suppression, personal safety should be your number one concern.

Lesson 7 will help prepare you for classroom training in safe fire suppression. It will:

- Explain basic principles of extinguisher operation.
- Present some very important rules for fire safety.

Lesson Summary

In this lesson you learned that:

- Fire requires heat, fuel, and oxygen. The combination of these elements can cause a chemical exothermic reaction (fire).
- There are four classes of fire, based on the type of fuel that feeds the fire.
- The type and quantity of fuel dictate the best methods and equipment for extinguishing a fire.
- The decision to extinguish a fire is based on personal safety and having the proper resources.

Next Lesson

You have completed this lesson. You are now ready to begin Lesson 6: Fire Hazards in the Home and Workplace.